Effect of Pressure on the Thermal Expansion of MgO up to 8.2 GPa *	X17B1

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As part of a broader and ongoing program to investigate effects of defect concentrations on thermal and elastic properties of wustite (Fe_xO) and to explore effect of Fe-Mg substitution on the room-temperature bulk moduli of magnesiowstite, isobaric volume measurements for MgO were carried out at 2.6, 5.4, and 8.2 GPa in the temperature range 300-1073 K using a DIA-type, large-volume apparatus in conjunction with synchrotron X-ray powder diffraction at beamline X17B of the National Synchrotron Light Source, Brookhaven National Laboratory. Linear fit of the thermal expansion data over the experimental pressure range yields the pressure derivative, $(\partial\alpha/\partial P)_T$, of -1.04(8)$\times 10^{-6}$ GPa$^{-1}K^{-1}$ and the mean zero-pressure thermal expansion $\alpha_{0,T} = 4.09(6)\times 10^{-5}$ K^{-1}. The $\alpha_{0,T}$ value is in good agreement with results of Suzuki (1975) and Utsumi et al. (1998) over the same temperature range, whereas $(\partial\alpha/\partial P)_T$ is determined for the first time on MgO by direct measurements. The cross-derivative $(\partial\alpha^2/\partial P\partial T)$ cannot be resolved because of large uncertainties associated with the temperature derivative of an at all pressures. The temperature derivative of the bulk modulus, $(\partial K_T/\partial T)_P$, of -0.025(3) GPa K^{-1}, obtained from the measured $(\partial\alpha/\partial P)_T$ value, is in accord with previous findings.

References:

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